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SCIENCE NEWS LETTER

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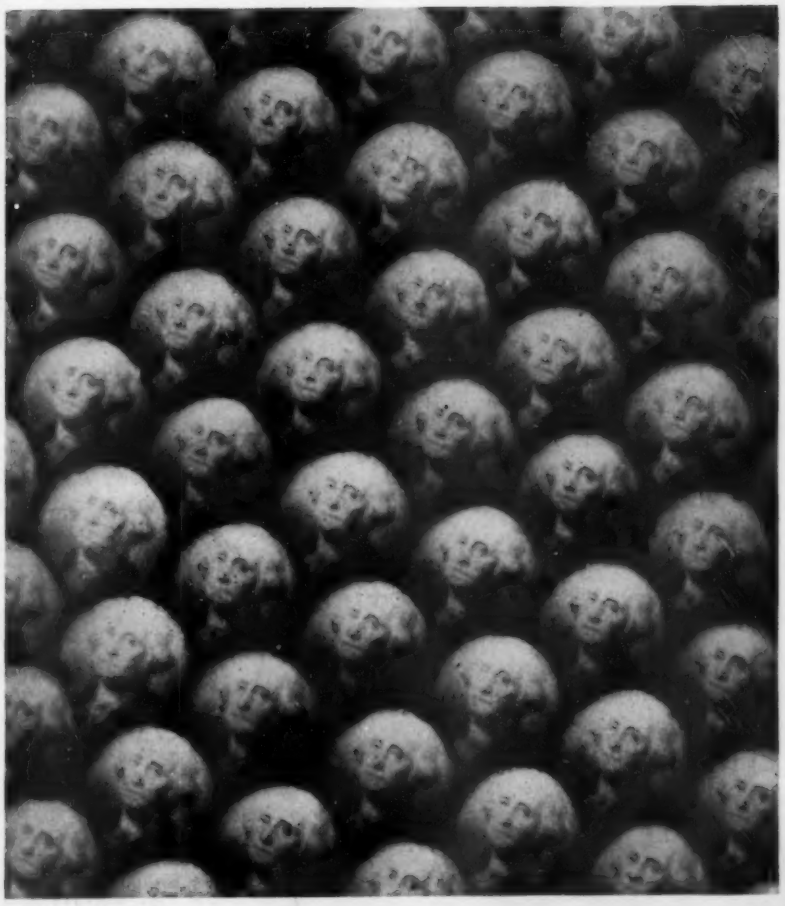
THE WEEKLY SUMMARY OF CURRENT SCIENCE •



JUNE 30, 1934

Through the Eyes of the Lowly

See Page 406

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VOL. XXV *No. 690*

The Weekly Summary of Current Science

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DO YOU KNOW?

Light has a rapid weakening effect on all grades of paper.

A British company will operate a chain of plants to extract motor fuel from coal.

An oxide film on the surface of steel will greatly reduce the wear in the contact of the steel against steel.

England is trying out electrically heated wallpaper made of copper-nickel wire, as a sort of radiant heating device.

Cellophane woven with wool into soft fabrics is being used in embroidered ribbons as trimming and to some extent in millinery.

A census of insects in Great Britain is being taken for the first time, by studying a "cross-section" of the insect population captured in light traps.

The cactus has gained such favor for indoor and garden use that several Southwestern states have passed laws to prevent wholesale removal of desert plants.

A method of speeding up the career of leather, so that it ages and deteriorates in a few months, has been developed by government chemists, in their researches to produce leather resistant to decay.

Indian farmers, like modern farmers, were plagued by cutworms.

The important sulphur deposits along the Gulf coast were first discovered when men were drilling for oil.

New York State has the problem of absorbing one-fourth of the foreign-born population in the United States.

The Romans were mostly dark-haired people, but the desire to be blonde led some Roman ladies to experiment with bleaches and other preparations.

A defrosting chamber which prevents moisture from condensing on chilled meats and poultry has been devised for Canadian packing houses.

To get a hydroelectric generating station to a mining camp in the wilds of New Guinea, the equipment will be carried forty miles by plane.

The races of man were set in their present forms, at least the white and black, as far back as the Aurignacian age, 30,000 years ago, a French scientist says.

Chemists find that if fruit in refrigerator cars is given a simple treatment of carbon dioxide, millions of dollars in loss from rot and disease in transit can be avoided.

WITH THE SCIENCES THIS WEEK

ARCHAEOLOGY

Why was the oldest peace treaty shaped like a net? p. 403. *The Sumerians—C. Leonard Woolley—Oxford*, 1928, $2.50.

ASTRONOMY

Does the sky ever rain gold onto the earth? p. 407.

How are the planets charged electrically as compared with the sun? p. 404.

Where do meteorites come from? p. 404. *Astronomy—R. R. Moulton—Macmillan*, 1931, $3.75.

ASTROPHYSICS

With what instrument was oxygen detected on the sun? p. 410.

AVIATION

How does smoke aid the airplane designer? p. 405.

ENTOMOLOGY

How many facets has the eye of a water bug? p. 406. *The Biology of Insects—George H. Carpenter—Macmillan*, 1928, $6.50.

MEDICINE

How does arteriosclerotic heart disease differ from angina? p. 404.

Why is milk denied to patients with lead poisoning? p. 409.

What causes rheumatism in children? p. 410.

ORNITHOLOGY

How are the trumpeter swans to be preserved from extinction? p. 411.

PHYSICS

How do California scientists hope to increase the production of neutrons a thousand fold? p. 408.

What were the three major objections to the corpuscular theory of the nature of cosmic rays? p. 403.

PLANT PHYSIOLOGY

What effect has the curling of corn leaves in dry weather? p. 409. *Principles of Plant Physiology—Oran Raber—Macmillan*, 1928, $3.

PSYCHOLOGY

Is an advertisement 4 inches square just twice as effective as one 2 inches square? p. 405.

Why do people tend to see stars as constellations? p. 410.

These curiosity-arousing questions show at a glance the wide field of scientific activity from which this week's news comes. Book references in italic type are not sources of information for the article, but the references for further reading. Books cited can be supplied by Book Department, Science News Letter, at publishers' prices, prepaid in the United States.

PHYSICS

Cosmic Rays Are Declared Principally Particles

Over Nine-Tenths of Energy Detected by Research Instruments is Thus Accounted For, It is Found

THE GREATEST piece of scientific detective work of modern times—the research to learn the nature of the baffling cosmic rays—is almost completed. Over nine-tenths of all the cosmic rays which scientists measure on stratosphere flights and in their world-wide surveys consist of positive particles streaming to earth from interstellar space.

This is the report which Dr. Thomas H. Johnson, assistant director of the Bartol Research Foundation at Swarthmore, Pa., presented to the American Association for the Advancement of Science.

"It is now possible to say with considerable certainty," declared the cosmic ray researcher, "that the particle part of the cosmic rays accounts for from 90 to 98 per cent. of the total intensity at the top of the atmosphere. It is highly probable therefore that by far the greater part of the cosmic radiation consists of positive particles and there is at the most but a few per cent. to be accounted for in some other way, possibly as a gamma radiation."

Dr. Johnson bases his contention that cosmic rays are really positively charged particles on the clearing up of the three major objections to the corpuscular theory of the radiation's nature. The former objections, he indicated, were:

First, that the particles did not have great enough energies to account for their often remarkable penetration through lead and other dense materials. Theory demanded that the rays (if they were particles) should have energies equal to 10,000 million volts. Most of the cosmic rays observed had only 600 million volts energy.

Second, the stopping of the rays as they came through the atmosphere of the earth was much too great. The absorption of cosmic rays, providing they were corpuscular in nature, was 25 times what it ought to be on theory.

Third, the amount of absorption as indicated by the range of the atom debris, which the rays knocked out of atoms inside cosmic ray instruments, did not vary with the energy of the incoming radiation. If the theory were correct, the absorption coefficient ought to change with energy. Observations have proved that for great differences of cosmic ray energy the absorption is either independent of the energy, or not related to it.

The first and second objections, said Dr. Johnson, have been advanced by Prof. Robert A. Millikan and his colleagues at the California Institute of Technology. The third is a new mystery advanced by himself, he added.

All three objections to the particle nature of cosmic rays may be solved, the Bartol scientist declared, if one realizes that the incoming corpuscular rays make direct hits on the nuclei of atoms in the air. These direct impacts cause the "showers" or "bursts" of cosmic rays detected by many observers.

It is probable, said Dr. Johnson, that every time one of the high-energy primary particle rays hits an atom nucleus it creates 25 secondary rays of the lower energy. The collision would account for the seemingly 25 times too great absorption of the rays and indicate that scientists have only a twenty-five to one chance of detecting the incoming high-speed particle. The secondary rays produced would be the "soft" 600-million-volt rays observed by Carl Anderson and others in the Wilson cloud chamber apparatus.

The nucleus impact phenomenon, Dr. Johnson added, is a chance occurrence. For still more penetrating rays with energies of 100,000 volts, a direct hit would produce about 1,700 secondary rays with energies commonly observed —the 600-million-volt rays.

With all this mixture of secondary radiation present in the instruments it would be a rare, lucky chance indeed which would demonstrate the existence of a really high-energy particle even though a large fraction of incoming radiation is of the positive particle type, he added.

"Shower production seems to be able," Dr. Johnson concluded, "to explain away the principal difficulties which have been raised with the corpuscular hypothesis and it is extremely unlikely that any other hypothesis would be able, in such a simple manner, to correlate so many cosmic ray effects. In fact, I think we may say that this hypothesis is now substantially proven, as an explanation of the principal part of cosmic radiation."

Science News Letter, June 30, 1934

ARCHAEOLOGY

World's Oldest Peace Treaty Carried a Curse

INTERNATIONAL worries over treaties have not changed much in 4800 years, judging by a look at the world's oldest peace treaty, which is now in the possession of Yale University.

The world's oldest known treaty of peace was made between two rival Sumerian cities, after bloody wars over a boundary line. The city of Lagash finally conquered the city of Umma about 2900 B. C., and the treaty drawn up between the two called for repara-

OLDEST PEACE TREATY

Peace between two cities was guaranteed by the words of this treaty. The conquering city had the clay treaty drawn up on a piece of clay shaped like a hunter's net. That was a sinister bit of diplomacy, meaning that the god Ningirsu would capture in his great net the vanquished people, if they dared break the terms. Curse or no curse, the treaty failed.

tions by the conquered city.

In the hope of scaring the city of Umma into keeping the terms of the treaty the inscription called on the god Ningirsu to capture the people in his great net and punish them if they should ever dare to cross the boundary contrary to the treaty terms. To emphasize the curse, the treaty was written on a clay cylinder shaped like a net such as hunters used to bag game.

Curse or no curse, the people of Umma rose in rebellion in a few years, and the peace treaty so cunningly drawn was discarded as a scrap of clay.

A document from a "New Deal" given to a country about 2650 B. C. is another exhibit selected from the Yale Babylonian Collection by Dr. F. J. Stephens, acting curator, to show the progress of Babylonian history from 3500 B. C. to about 150 B. C.

The New Deal was given to the city of Lagash by King Urukagina, who rose as champion of the people in a time of great unrest and corruption. He brought about changes in government which greatly improved the lot of the common people, says Dr. Stephens.

Science News Letter, June 30, 1934

MEDICINE

Arteriosclerotic Heart Disease Is On the Increase

PEOPLE today are unquestionably wearing out sooner because of the faster pace at which they are living.

So declared Dr. Fred M. Smith of Iowa City during the meeting of the American Medical Association in Cleveland. A leading cause of death today is arteriosclerotic heart disease, which is essentially a wearing out process.

He and his associates, Drs. W. D. Paul of Iowa City and H. W. Rathe of Waverly, Iowa, told the story of this disease in an exhibit at the meeting and in a report of four hundred cases to the American Heart Association, which also met in Cleveland.

The number of deaths from heart disease is much greater today and has increased much faster in the last twelve years than the numbers from either cancer, pneumonia or tuberculosis. The latter disease, in fact, has shown a decrease.

Fully half of the heart deaths are due to arteriosclerotic heart disease. In this condition the space inside the arteries of the heart itself is gradually encroached upon till it becomes so small the blood can hardly get through, or it may be entirely stopped by what physicians call an occlusion. As a result, the part of the heart muscle supplied by the diseased or occluded arteries does not get enough blood to perform its share of the heart's work.

Fortunately, the heart has a remarkable capacity to compensate for this condition, the unaffected part taking over the entire job of pumping blood out into the body. Fortunately, also, physicians have found certain drugs which actually dilate arteries that are being closed up. Rest is also very helpful in this condition, because it reduces the amount of work the heart must do and the quantity of blood it needs.

Pain in the chest, often severe and lasting anywhere from several hours to several weeks, is the chief symptom of this heart ailment. Shortness of breath is another symptom. Angina pectoris may also be present.

The pain in arteriosclerotic heart disease is different from the pain in angina both as to location, duration and type. An important difference is that the pain in angina comes on during exercise, excitement or exertion of some kind, while the pain of arteriosclerotic heart disease frequently occurs while the patient is resting, or wakes him out of his sleep at night.

Physicians do not know how to prevent this type of heart disease, though more moderate living habits may help.

Science News Letter, June 30, 1934

ASTRONOMY

Electrical "Tides" Suggested As Cause of Sunspots

THE FAMOUS eleven-year sunspot cycle which astronomers have been observing for decades may be caused by the electrical interaction of the sun and its neighboring planets, Venus, the earth, and Mercury.

The suggestion that sunspots result from electrical "tides"—to use a moon and earth analogy—was advanced by Fernando Sanford, emeritus professor of physics at Stanford University before the Astronomical Society of the Pacific at its meeting. The Society met in conjunction with the American Association for the Advancement of Science at the University of California.

All the planets have strong negative electric charges upon them with respect to the sun. Since the planets move in orbits which take them alternately near and away from the sun Prof. Sanford suggests that at the nearest position the increase in electric field between various solar bodies might produce the sunspots. If this situation is true, a check of sunspot activity and the proximity of the planets to the sun should show some correlation.

Studies of sunspot cycles from 1750 to 1928 show, the veteran scientist declared, the sought-after correlation between sunspots and the periods of conjunction of Venus and the earth on one hand; and Venus, Mercury and the earth on the other.

Prof. Sanford maintains that Venus and the earth are responsible for the eight-year sunspot cycle while Venus, Mercury and the earth cause the more easily recognized eleven-year cycle.

Science News Letter, June 30, 1934

ASTRONOMY

Age of Meteorites Points To Origin in Solar System

METEORITES, the bits of cosmic matter which stream about through space and sometimes fall flaming to earth, are members of the solar system which holds the sun and the earth.

Experiments using a radium time-clock to estimate the age of meteorites were reported to the American Association for the Advancement of Science by Dr. Robley D. Evans of the University of California which prove the origin of the shooting stars.

The clock used by the California scientist is the radioactive disintegration of the element uranium into lighter elements, including radium. In the process, atoms of the light gas helium are given off. When a sample of meteoric material is "new" it has little helium in it; when old it may be saturated with the gas. Determining the ratio of helium to radium in a rock sample is a check on its antiquity.

Scientists all over the world, declared Dr. Evans, have now checked the age

of about 200 samples of meteorite material. Their age agrees with that of terrestrial rocks—between 100 and 3,000 million years. This shows that earth-originated and cosmic materials both have their origin in the solar system.

As radioactive elements break down into lighter ones, Dr. Evans indicated, heat is generated. This source of heat, he declared, "is more than adequate to supply all the heat lost from the earth by conduction through its crust, as well as to supply the energy for all mountain building processes, including earthquakes and volcanoes; to supply an excess of heat sufficient to cause convection heat currents in the underlying rocks and hence to provide the energy and mechanical requirements needed to make possible the gradual drift or motion of continents across the earth's surface."

Science News Letter, June 30, 1934

AVIATION

Smoke and Soot Reveal Air Currents on Airplane

THIN fleecy layers of white smoke, the same kind as that used in sky writing and smoke screens, are being used to permit scientists actually to see the otherwise invisible air currents and eddies around the wings, body, and tail of airplanes, during both flight and in experiments in wind tunnels.

In other tests conducted at Langley Field, Virginia, under the National Advisory Committee for Aeronautics, airplanes take on the appearance of having just come through a blizzard, except that the tell-tale marks left by wind whistling through struts and over ailerons are black streaks of soot instead of trails of white snow. Streamers of fine silk threads are also used, and photographs are taken during different maneuvers to show what happens close to a wing surface during a bank, stall, or glide.

The forces which various parts of an airplane must resist in flight and maneuver can easily be measured in a laboratory. Data taken in tests on small-scale models or even full-sized airplanes are useful in designing new features, but these experiments are of the trial-and-error variety. The scientist finds out what the result will be although he can not see what takes place. However, by shooting thin sheets of dense white smoke through a wind tunnel it is possible to discover what happens, since all the small whirlpools and cross-currents of air give a startling smoke-picture of what occurs in an ordinarily invisible medium.

The soot for discovering air-channels is a paste made up of lampblack and kerosene. This is painted zebra-like on the various surfaces in streaks at right angles to the direction from which the wind is expected to come. The plane is subjected to a gale, either in the wind tunnel or in actual flight. The mixture, streaked away by the wind from the original lines, is allowed to dry. Resembling a smudged ink line, the daubed surfaces indicate the curving streams of air.

Science News Letter, June 30, 1934

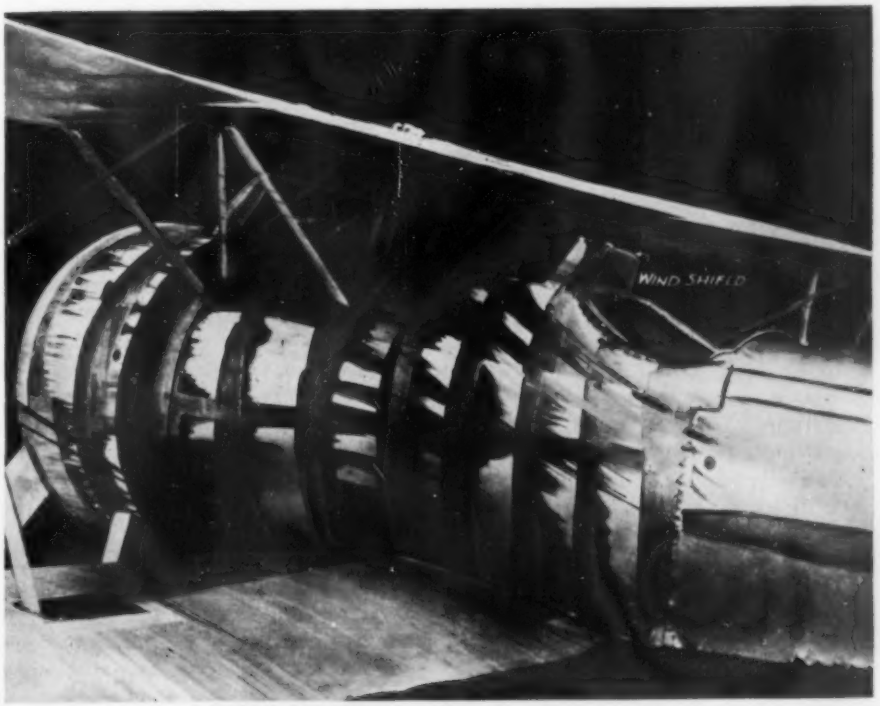
PSYCHOLOGY

Value of Advertisement Increases With Size

THAT the value of an advertisement increases with size, but that the increase in value is not in direct proportion to the increase in area, was confirmed in tests reported by Leonard W. Ferguson, of the Psychology Department, Stanford University, to members of the American Association for the Advancement of Science.

Three methods were used in the tests: the subjects were allowed to look through a magazine and then try to remember advertisements seen; the number of inquiries in proportion to size of advertisement was computed; and, third, the subjects were required to pick out from a group of advertisements those he had previously seen in a magazine through which he had been asked to look. An average of all three methods indicated a direct increase in value in proportion to size, but the inquiry and recognition methods indicated that the value increases more nearly in proportion to the square root of the area. An average of 22 other ratios, previously reported by scientists, confirmed the square-root ratio result.

Science News Letter, June 30, 1934



"SEEING" INVISIBLE AIR CURRENTS

A plane flown after mixture of soot and kerosene has been painted in vertical strips on wings and body. The streaking of soot indicates downward currents acting on airplane.

ENTOMOLOGY

Sight is Wealth Even to Humblest

The Insect Views His World Through Myriad Lenses, Yet May Perceive Much the Same Forms as Does Man

By DR. FRANK THONE

See Front Cover

MAN, by self-appointment Monarch of the World, strides in ponderous majesty across the meadows, crashes through the undergrowth in the woods. Quite alone, he tells himself, looking about with self-satisfied, unobservant eyes.

Quite alone? Not by any manner of means. Every step of the way is cleared by scores or hundreds of little creatures, which do not dare to challenge his overpowering bulk, but which are as quick to see him as he is slow to notice them. Their eyes may not be as good as his, but they use them to better purpose.

As indeed they must. Down in the fierce and merciless little world among the weeds and grasses there are no agreed-on codes of fair competition. The only ethic is still that of the jungles kill and be killed, eat and be eaten—intensified rather than ameliorated by being focussed into such small parcels of hungry and anxious life. Every sense and faculty must be incessantly ready for service in fight or flight; even momentary inattention is a crime which automatically invokes its own death-penalty.

Now, of all the messengers sent by the outer world to a living creature's sense organs, light is the swiftest and most direct. Scent depends on the wind, and the wind is always half a traitor, for it leaves everything to leeward, or "downwind" quite in the dark so far as warning odor is concerned. The same treasonable wind, though it cannot quite extinguish warning sounds, can and does distort them and give them false direction; for sounds travel in air and may thus be bent by the wind that moves the air.

Seeing is Believing

But light plays no such tricks: what can be seen is much more reliable "news" to the brain, whether reasoning or merely automatically reacting, than what is heard or smelt or felt. So when you come trampling into their ken, the insects and spiders and other creeping things receive, through their multiplex eyes, unmistakable warning to "scram!" For the moment of your crushing coming, at least, the jungle distinctions between predator and prey are wiped out in a common seeking for safety; there is a leveling truce of terror among the Very Small in the presence of the Very Big. The motion to adjourn is carried by a tremendous majority of Eyes.

On scrabbling feet, on leaping legs, on whirling wings they go—all except those well camouflaged in leaf-green or stick-brown, or too dull of sight or wit even to run for their lives. Those that see best leave earliest, and are likeliest to go farthest; for the best eyes go with the best wings.

After you have passed, of course, the normalcy of hungry hunt and fear-driven flight settles over the deceptively peaceful-appearing meadow or brushland again, until another major apparition of doom (perhaps only a cow, this time) comes crashing along.

What is the Mechanism

How are these little citizens of our familiar countryside jungles equipped to spy us from a safe distance—the few feet or even the few inches that enable them to seek safety before a crushing foot descends, or a clumsy giant motion knocks them into a possibly wing-crumpling fall? What are these multiplex eyes like? Do they resemble our own? If not, are they superior or not so good?

The answer is a paradox. The eyes of insects and their relatives are basically like our own, but in almost every particular they are different.

The human eye has a small opening, the pupil, through which the light passes. Its size is variable, controlled by the bordering iris. The light is focussed by a remarkably flexible, adaptable lens, and the image it forms falls on a network of light-sensitive nerve ending cells, the retina, as a single picture for transmission to the brain.

The insect eye is built as unlike that as can possibly be imagined and still be an eye. Instead of being a single, unitary structure, it is made up of a large number of distinct sections, or "facets." In effect, each facet is a slender wedge or inverted steeple-like p y r a m i d, squeezed together on all sides by its crowding companion facets. An orange sliced crosswise gives a rough notion of the cross-section of an insect's eye; the fruit of the Osage orange, formerly much used for hedges, affords an even better model.

Cannot be Focussed

Each of these facets is topped by a rounded, lens-like horny front. It does serve after the manner of a lens, but it cannot be focussed as the lens in your own eye can, so that it presumably does not form so sharp an image on the bottom of its narrow little cone. But the very narrowness of the cone limits to some extent the imperfection of the image, and also helps (along with all its neighbor cones) to give a very acute perception of movement in what the insect eye chances to be loking at.

At the bottom, or narrow end, of this lens-topped cone are just a few light-sensitive nerve-endings, or "retinal elements." The picture formed by an insect's eye, then, is a patchwork or mosaic, with the image repeated over

"WITH ROUND EYES OF WONDER"

When a young insect comes into the world, as this golden-eyed lace-winged fly is doing, the first things that emerge are its information-getters—its many-faceted eyes and sensitive, exploratory antennae.

and over a thousand or ten thousand times, depending on the number of facets in the compound eye. Scientists are of the opinion, however, that by the time this compound picture has been transmitted to the insect's brain it has somehow been blended into one—just how, it is not certain.

Eyes Nearly Cover the Head

Such, then, is the eye that is turned on your approaching bulk, multiplied myriad-fold by the numbers of small lives that hasten to get out of your way. Perhaps the most magnificently developed insect eyes in the world belong to the dragon-flies: they cover almost all of the creature's head, and enable it to see not only approaching possible enemies, but also to detect, pursue and capture unerringly on the wing the mosquitoes and other small insects that are its food. At the other end of the scale are the small, poorly developed, dull-seeing eyes of earth-dwelling beetles and other primitive insects; some of them, indeed, being quite without eyes, useless in the perpetual dark of their chosen dwelling-places.

In addition to these remarkably developed compound eyes, insects have smaller, simple eyes on top of their heads. These little eyes, or "ocelli," are of supplemental use.

Compound eyes are distributed throughout the great animal group that includes not only insects but spiders, scorpions, lobsters and crabs. Spiders have no less than eight eyes apiece, distributed variously on their fearsome "faces."

Like a Camera

The eye of a mammal is an optical instrument resembling in its plan a photographic camera, the lens being analogous to the camera lens. It is double-convex and focuses the images of the objects upon the sensitive back wall inside the eye, just as the camera lens focuses the images upon the sensitive plate within it.

A consideration of these facts suggested to Prof. Walter E. Flowers of Spokane, Wash., the possibility of removing the crystalline lens from the eye of a recently killed animal, mounting it carefully and using it to make photographs. After a number of rather difficult experiments he made some unusually interesting photographs.

The photograph of an ordinary house-fly, which was made by the crystalline lens taken from the eye of an ox, is shown on this page. The natural lens was simply mounted in the camera in the place of the ordinary camera lens.

A FLY AS SEEN BY AN OX

This experiment was extremely difficult on account of the softness and delicacy of natural lenses. They had to be handled with camel's hair brushes and only a small percentage of those so mounted could be uninjured and capable of producing a perfect photograph. In these experiments Prof. Flowers found a few lenses imperfect because of the growth of cataracts, which made portions of the lenses opaque.

The perfect crystalline lens is a very beautiful object, being entirely colorless and transparent. It refracts light very strongly and is capable of producing exceedingly perfect images upon the photographic plate. As it magnifies considerably, it can be used for a class of work which is intermediate between ordinary photography and that of microscopic photography.

Prof. Flowers believes that further experiments with crystalline lenses from different eyes may more fully demonstrate their usefulness and lead to important practical results, especially if a method of fixation for hardening these lenses could be found which would allow them to retain the exquisite beauty of form and transparency they have in the eye of the living animal.

Into the small space of a water beetle's eye are crowded about 20,000 facets, perfectly hexagonal in shape, each one a perfect lens capable of producing images of an object. If a portion of the cornea is removed and spread flat on a glass slide, it is possible to make a multiple image photograph by the combined use of the microscope and camera. When this photograph is taken, the images are entirely too small to be seen except through a microscope.

The mosaic photograph of George Washington on the cover of this week's SCIENCE NEWS LETTER was made in this way by Prof. Flowers. Exceedingly careful adjustments, delicate lighting and exact focusing were necessary. A special developer was required for the plate and utmost care was needed in its manipulation to bring out details.

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Science News Letter, June 30, 1934

ASTRONOMY

First "Gold From Sky" Found in Meteorite

SCIENCE'S first recorded discovery of gold that has fallen from the sky to the earth was reported by Dean Gillespie of Denver, to the American Association for the Advancement of Science.

A stony meteorite found near Melrose, New Mexico, was analyzed by H. G. Hawley of the Nininger Meteorite Laboratory in Denver. Minute amounts of gold were detected. Just to be sure, this unusual result was checked by an American Smelting and Refining Company assay.

There will, however, be no gold rush to the shooting stars, because the quantities of gold are entirely impracticable for commercial recovery.

Science News Letter, June 30, 1934

THE ANCESTRY OF THE LONG-LIVED

Raymond Pearl
Ruth De Witt Pearl

This book deals with the ancestry of a group of persons living at very advanced ages. All of the persons in this group were nonagenarians or centenarians at the time they were studied.

181 pages, $3.00

The Johns Hopkins Press Baltimore

PHYSICS

Atom-Smashing Artillery To Be Increased in Power

Physicists at Berkeley Meeting Reveal Plans For Apparatus With Five to Ten Times Potential Now Used

ELECTRICAL forces of from twenty to thirty million volts, approaching Nature's lightning and five to ten fold greater than the highest potentials now being used in atom smashing, will be available in the immediate future for science's attack on what is perhaps its most important problem—the baffling mystery of the constitution of matter.

Encouraged by the great progress now being made from week to week in the scientific laboratories all over the world, plans are being pushed at the University of California and Massachusetts Institute of Technology for higher-powered atomic artillery. Preliminary details of the new high-voltage race became known at the sessions of the American Physical Society, meeting jointly with the American Association for the Advancement of Science.

Immediate and simple changes in the atom-bombarding "merry - go - round" apparatus of Prof. E. O. Lawrence and his University of California colleagues will raise its voltage from its present five million rating to twenty million volts. The present equipment, in which particles are speeded up by oscillating electricity and kept inside the apparatus by the influence of an 85-ton magnet, will shortly be quadrupled in diameter.

From scientists present at the meeting from M. I. T. it was learned that within a year or two a still more powerful brother to the giant ten million volt electrostatic generator of Dr. Robert J. Van de Graaff will be made ready at Round Hill, Mass., for the world's most energetic attack on atoms. About thirty million volts driving force for atom "bullets" is expected from this new machine of Dr. Van de Graaff, which will be built in a steel tank evacuated of all air to create the necessary insulation.

Despite its great increase in power over present-day apparatus the contemplated device will occupy less space than the ten million volt machine now in use, which is so large that an airship hangar is its home.

The steel tank for the new device will be only about ten feet in diameter and twenty-five feet high. A small experimental edition of the vacuum-surrounded generator is now under construction in Cambridge, Mass. A novel feature of the apparatus will be a chain belt made of stainless steel, nickel and porcelain for carrying electric charges up to the large spheres.

Desirous of increasing their supply of neutrons, which is already the world's greatest, California experimenters have a scheme to increase neutron emission for atomic investigation some 1,000-fold. Hydrogen will be packed into the whirligig chamber of Prof. Lawrence. The sides of the chamber will be lined with the metal beryllium, which when bombarded will yield immense quantities of the desired neutrons.

Since neutrons have just been shown in Italian experiments to be extremely effective agents in producing artificial radioactivity in ordinary stable elements it is hoped that the new technique will make possible new and practically useful reactions of new elements and artificial radioactivity.

The recent discovery of the superheavy element No. 93 by Prof. Enrico Fermi encourages the hope that the improved American pieces of atomic artillery will add still more elements to those now known.

Science News Letter, June 30, 1934

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SEISMOLOGY

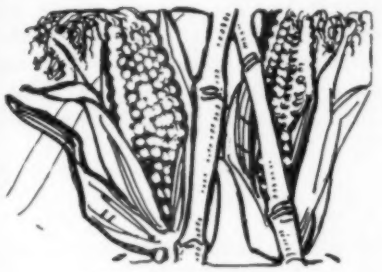
Seismographs Record Earthquake in Alaska

AN EARTHQUAKE shook interior Alaska, north of Cook Inlet, on Monday, June 18, at 4:13.8 a. m., Eastern Standard Time, according to data received telegraphically by Science Service and interpreted by scientists of the U. S. Coast and Geodetic Survey. The epicenter was in 62 degrees north latitude, 150 degrees west longitude.

Science News Letter, June 30, 1934

PLANT PHYSIOLOGY

NATURE RAMBLINGS
by Frank Thone



Drought Defenses

DROUGHT does not slay plants by drying out their leaves as though they were just so many damp green garments hung on a line. The story is not at all so simple as that.

Plants have their defenses against drying out, and the nearer they come to the danger-point the more they resist further drying, as a rule.

Some plants, like the cacti and century-plants of the desert, have developed under such hostile conditions that they are constantly on the defensive, resisting the loss of water even when water is relatively abundant. Most common plants, however, of the kind found in cultivated fields and wild in the woods and on the roadsides, yield water freely to the air as long as they can get it freely from the soil. Only when the demands of the thirsty air become too insistent do they start to shut off their water-outlet valves.

Mechanisms for cutting down water loss are various. Almost universal are the closeable stomata, or microscopic respiration pores. These are on the undersides of most leaves, but on both sides of some. Normally these "little mouths"—for that is what they are shaped like and what their Greek name means—close during the hottest part of the day in all sunny weathers. During severe drought they close and stay shut practically all the time, thereby cutting down the outgo of water vapor.

When worried farmers report that the leaves of their corn have begun to curl, it means that the plants have brought another defense into play, against a more severe drought condition, bearing a more serious menace. For the incurling of the edges of a leaf reduces considerably the area (*Turn to Page* 411)

MEDICINE

Lead Poisoning Helped By Special Phosphorus Diet

A SPECIAL diet which was helpful in treating cases of lead poisoning was reported by Dr. Irving Gray of Brooklyn at the meeting of the American Medical Association. Lead poisoning is one of the greatest of all industrial hazards.

The diet is one which contains much phosphorus and little calcium. It helps in getting the lead out of the body, actually dislodging it from the tissues where it has been deposited. The diet treatment is based on the discovery of American investigators that the storage of lead in the body tissues is favored by a high intake of calcium, while elimination of lead is increased by lowering the calcium intake.

Dr. Gray reported four cases of persons who had worked with lead for only a few months. "Deleading" by diet and medicine removed the lead from their systems in two weeks. In three other cases so much lead had been deposited that it required three or four courses of treatment to "delead" the patients.

Too rapid "deleading" may prove dangerous. Consequently Dr. Gray advises that the treatment be carried out in a hospital.

The diet includes such foods as eggs, whole wheat bread, lamb chops, liver, green peas, pineapple juice, baked potatoes and halibut, which all contain large amounts of phosphorus. Phosphorus literally pulls the lead out of the tissues.

All milk is omitted from the diet because milk is the most important dietary source of calcium.

Science News Letter, June 30, 1934

THE JOURNAL OF NUTRITION

Official Organ of the American Institute of Nutrition

Published monthly by The Wistar Institute of Anatomy and Biology. John R. Murlin, Managing Editor, Rochester, New York.

Price, $5.00 per volume, Domestic; $5.50 per volume, Foreign. Two volumes issued annually. Back volumes from 1 to 7, inclusive, may be had for $35.00. Volume 8, Number 1, current.

THE WISTAR INSTITUTE STYLE BRIEF

Containing 170 pages, 23 text figures and 37 plates, published January, 1934

This guide for authors, in preparing manuscripts and drawings for the most effective and economical method of publishing biological research, has been prepared by the Staff of The Wistar Institute Press and the coöperative efforts of more than fifty editors concerned in the editing of journals published by The Wistar Institute, and presents the consensus of opinion on many points relating to the mechanical preparation of manuscripts and drawings for the printer and engraver. Due attention has been given to the relative costs of various methods of reproducing tables and illustrations with a view to reducing the costs of publishing papers.

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By Arnold Gesell, M.D.,

Director of the Clinic of Child Development, Yale University

This Atlas provides a first systematic delineation of the early development of human behavior patterns. It is illustrated with over 3000 action photographs based on cinema and stenographic records collected during a period of seven years.

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Volume II

In collaboration with Alice V. Keliher, Ph.D., Frances L. Ilg, M.D., and Jessie Jervis Carlson, Ph.D.

Naturalistic Series. This volume portrays the behavior of similar normal infants under the natural conditions of domestic life; feeding, bath, play, sleep, parent-child relationships, and social situations involving other children and adults. The basic photographic data consist of extensive 35 mm. records.

Both volumes are bound in a special steel spring format, 12 x 2 x 12 inches which permits convenient manipulation of the loose leaf contents for seriated, comparative study. The comprehensiveness and systematic arrangement of both text and illustrations will make the Atlas serviceable as a reference book and research aid in varied fields of the biological sciences, including genetic psychology, anthropology, embryology, and neurology. The edition is limited and the use of a full-tone, gelatine engraving process will make reprinting impossible.

Two Volumes **Price $25.00**

Publication date, September 11, 1934

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In Science Fields

ASTROPHYSICS

Oxygen Discovered In Sun's Chromosphere

OXYGEN in the atomic state has been discovered for the first time in the chromosphere of the sun, by Harold D. Babcock and Horace W. Babcock of the Mt. Wilson Observatory. Their work was reported before the meeting of the Astronomical Society of the Pacific.

The presence of oxygen in this portion of the sun was detected by means of a spectrograph, the instrument commonly used for studying light after it has been split into its various component colors, which disclose the chemical elements in the light-source by characteristic bright and dark lines.

The oxygen line was found in the green part of the spectrum.

Science News Letter, June 30, 1934

PSYCHOLOGY

Strange Visual Defect Described to Scientists

A RARE and peculiar visual defect, causing its victim to see objects before him all blurred together into one was described to the meeting of the American Association for the Advancement of Science. The abnormality was observed in a college student by Dr. D. M. Purdy, of the University of Kansas, who said that the young man had partially overcome his defect by training in a more analytical attitude.

The student had no defect in his eyes that would account for his peculiar vision; it was undoubtedly an abnormality of brain function rather than eye function, Dr. Purdy said. When he looked at any sort of pattern fixedly, it would rapidly blur away; objects would be swallowed up by the background.

Yet the young man, called X by Dr. Purdy, was finally able to control this difficulty merely by learning to isolate mentally the details of a pattern from one another.

The odd defect is not so much a positive disability as it is the absence of the normal ability to be analytical. Modern psychologists have emphasized the fact that the normal person's field of vision is not a mosaic of separate bits of color, but larger coherent wholes. You are not aware of all the millions of tiny specks of black, white, brown, green, and so on, that appears before you; rather you see trees, chairs, people. Even when looking at the stars, most people do not see them individually but tend to group them into constellations or patterns.

Mr. X has this tendency to an abnormal degree.

Science News Letter, June 30, 1934

MEDICINE

Vitamin Lack May be Cause Of Rheumatic Diseases

ANOTHER disease has been traced to lack of vitamin C, deficiency of which is already known to produce scurvy. Dr. James F. Rinehart of the University of California Medical School, using his own and other experiments, reported to the American Association for the Advancement of Science that vitamin C deficiency may be an important factor in the cause of rheumatic fever and rheumatoid arthritis.

These are illnesses that usually attack undernourished children just when they are growing fastest. Their joints become acutely painful, swollen and reddened, and frequently heart injuries are produced which handicap the youngsters for the rest of their lives. Rheumatic fever usually comes in the spring and attacks the poor children in cities.

If the proper food containing vitamin C is not eaten, the body seems to be peculiarly susceptible to infection by the hemolytic streptococcus germ, and the combined result is disease. Experiments upon animals uphold this idea and convince Dr. Rinehart that the germ infection is not the complete cause.

The next step expected is the application of the discovery to the actual prevention and treatment of human cases.

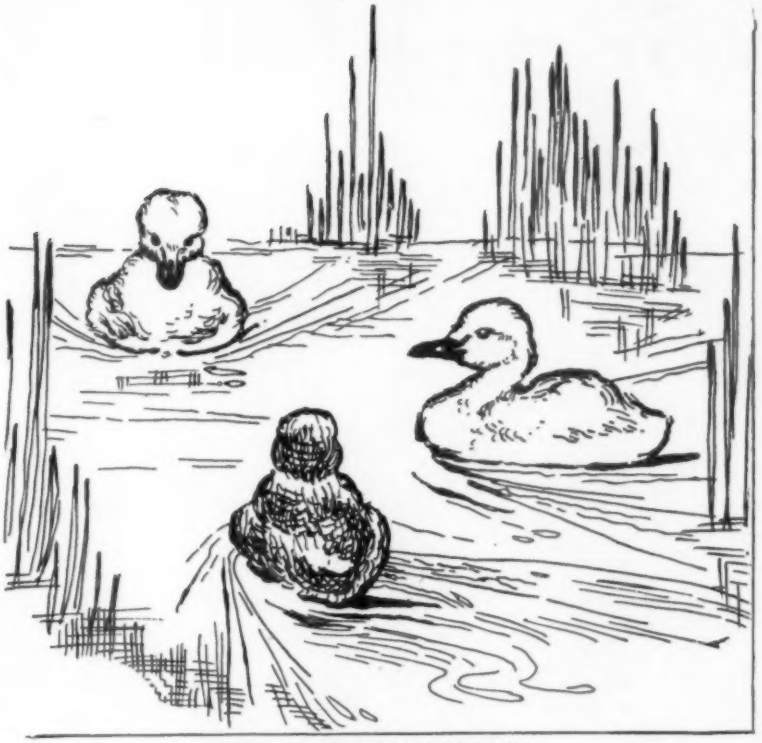
Science News Letter, June 30, 1934

GENERAL SCIENCE

Scientific Union Support Continued

BOTH House and Senate have passed a bill authorizing the payment of the annual share of the United States in the International Council of Scientific Unions and associated unions.

Science News Letter, June 30, 1934



NOT "UGLY DUCKLINGS"

The offspring of the Trumpeter Swan, in their appealing and attractive infancy, sketched by Margaret L. Arnold in Yellowstone National Park while her husband, a ranger, missed meals and sleep in order to guard the little birds against prowling enemies. (See SNL, Jan. 27, 1934, p. 57).

ORNITHOLOGY

Trumpeter Swans to Be Given Artificial Islands

YELLOWSTONE National Park is the last stand of a species of magnificent birds, the trumpeter swans, whose chances of survival are more problematical now than were the chances of the bison a generation or so ago, when the come-back of the western herds began. In an endeavor to give the few remaining swans the best possible opportunity to rear their young in safety, CCC workers are building small artificial islands in the little lakes where they breed. On these, it is expected, the birds will build their nests.

Careful check-ups of the trumpeter swan population by naturalists of the National Park Service have shown a hopeful increase during the past three seasons. In 1931 there were 20 adult swans and 15 cygnets (young). In 1932 the count was 58 swans, 12 cygnets; in 1933 there were 49 swans, 17 cygnets.

This looks like an exceedingly small population, but Yellowstone oldtimers remember that the little group of less than thirty bison introduced into the Park a little over a generation ago has grown up into the present huge herd and so decline to be discouraged over the swan situation—just yet, at any rate.

Science News Letter, June 30, 1934

From Page 409

directly exposed to hot sun and wind.

Finally, when even this and other mechanical devices of the leaves have failed, and the plant is near complete collapse, the living content, the protoplasm, of each individual cell has its last stubborn bit of resistance to offer.

Protoplasm is a thickish stuff, under normal conditions resembling mucilage or thinned-out white of egg. It has the same resistance such substances have, to giving up the last bit of its water. A drop of egg-white or mucilage stays moist long after a similar drop of pure water has evaporated completely.

So it is also with protoplasm. It will resist complete drying out for a long time, and if rescuing rain comes, it will soak up enough to restore it to normalcy in an amazingly short time. It is this, mainly, that accounts for the quick greening of apparently burned-out pastures after a drought-breaking rain.

Science News Letter, June 30, 1934

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The Electromagnetic Field
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"Here is a new approach to the study of qualitative analysis. . . . The author is to be complimented for the way in which he has correlated periodic properties with analytical behavior." *Journal of Chemical Education.* **$2.00**

The Reaction between Hydrogen and Oxygen
By C. N. Hinshelwood and A. T. Williamson
A significant new work on a subject which is of fundamental importance both chemically and kinetically. Just published. Mr. Hinshelwood's *Kinetics of Chemical Change* ($5.00) is now in its third edition. **$3.25**

Man's Place among the Anthropoids
By W. K. Gregory
The author of this book, who is Professor of Vertebrate Palaeontology at Columbia University, has written with a "simplicity and clarity that will appeal to the lay as well as to the scientific audience." *Science News Letter.* **$2.50**

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First Glances at New Books

Protistology

THE MYXOMYCETES—Thomas H. Macbride and G. W. Martin—*Macmillan,* 339 p., 21 pl., $6. The late Dr. Macbride, like Copernicus, just lived to see the completion of this, his *magnum opus,* which was carried through to publication by his thorough and careful younger collaborator. The subtitle: "A descriptive list of the known species with special reference to those occurring in North America," tells its own story of the expansion of the field of the present work over that of Dr. Macbride's earlier myxomycete book, "The North American Slime Moulds." Although the preface modestly disclaims finality, botanists generally will gladly disagree to the extent of recognizing it as "final—to date," on matters concerning these most interesting, but to most of us most obscure, plant-animals.

Science News Letter, June 30, 1934

Forestry

IDENTIFICATION OF THE TIMBERS OF TEMPERATE NORTH AMERICA—Samuel J. Record—*Wiley,* 196 p., 6 pl., $3. This is a book that will be very useful to the student now preparing for service in the forests which America is undertaking to rebuild, and also to his elder brother already in the field. It is a thoroughly scientific treatment, approaching the problem from a solidly phylogenetic viewpoint, and thus insuring its success. The first part comprises a general and thorough-going discussion of wood structure; the second, an annotated "keying-out" of the various kinds of wood native to this continent.

Science News Letter, June 30, 1934

Geophysics

APPLIED GEOPHYSICS IN THE SEARCH FOR MINERALS—A. S. Eve and D. A. Keys—*Macmillan,* 296 p., $4.25. Second edition of a book of interest to geologists generally, and of great practical value to mining and oil geologists in particular. It tells the *why* for the research student, and the *how* for him who seeks mineral or oil.

Science News Letter, June 30, 1934

Botany

TREES OF THE SOUTHEASTERN STATES—W.G. Coker and H. R. Totten—*Univ. of North Carolina Press,* 399 p., $2. Nowhere in the world, at least in the more accessible parts of the world, will so rich a temperate-zone forest flora be found as in the southeastern United States. Yet hitherto a good book that would enable scientist and intelligent layman alike to find his way about in this wonderful forest country has been lacking. The present authors supply that lack, just as the New Deal begins to stress the importance of forestry, as well as forest recreation, in that very region.

Science News Letter, June 30, 1934

Physical Chemistry

THE KINETICS OF REACTIONS IN SOLUTION—E. A. Moelwyn-Hughes—*Oxford University Press,* 313 p., $5. Not many years ago the kinetic theory was believed to be restricted to the comparatively few reactions which occur in gases. The author, who is lecturer of Trinity College, Oxford, has written this book to show that reactions in solution—that is, the phenomena of chemical change in general—can profitably be examined in the light of the kinetic theory. It is a comprehensive treatment.

Science News Letter, June 30, 1934

Physics

EXPOSÉS DE PHYSIQUE THÉORIQUE: Pt. X LES PRINCIPES DE LA MÉCANIQUE GÉNÉRALE — Jean-Louis Destouches—53 p., 15 fr.; Pt. XI, RELATIONS D'INCERTITUDE EN GÉOMÉTRIE ET EN PHYSIQUE—M. Georges Bouligand—28 p., 9 fr.—*Hermann et Cie., Paris.*

Science News Letter, June 30, 1934

Zoopsychology

A FIELD STUDY OF THE BEHAVIOR AND SOCIAL RELATIONS OF THE HOWLING MONKEYS—C. R. Carpenter—*Johns Hopkins Press,* 168 p., $2.25. Probably the noisiest of primates (not excepting even Man) the howling monkeys have also proved to be one of the most interesting, as a source of data on comparative behavior among our tree-top cousins.

Science News Letter, June 30, 1934

Radio

THE FUTURE OF RADIO AND EDUCATIONAL BROADCASTING—Levering Tyson and Judith Waller—*University of Chicago Press,* 32 p., 25c.

Science News Letter, June 30, 1934

Mental Hygiene

MENTAL HYGIENE OF THE SCHOOL CHILD—Percival M. Symonds—*Macmillan,* 321 p., $1.50. Intended for teachers, this volume is extremely valuable to anyone having contact with growing personalities. Emphasis is placed on the positive aspect, the prevention of mental and emotional distortions, the healthy development of the child. Specific instances are given of correct mental habits to encourage. The chapters are short and pithy and followed by thought-provoking questions.

Science News Letter, June 30, 1934

General Science

GUIDEBOOK OF THE WESTERN UNITED STATES: PART F: SOUTHERN PACIFIC LINES, NEW ORLEANS TO LOS ANGELES—N. H. Darton—Govt. Print. Off., 304 p., 29 folded maps, 49 pl., $1. A worthy companion-volume to the older books that guided the traveller along the northern railway lines, and a most interesting companion to have along on a train trip from the South to the Southwest. Mile by mile it tells you of the geology, botany and zoology of the country, of its natural resources, of towns and settlements, of salient historical facts.

Science News Letter, June 30, 1934

Ornithology

CHECK-LIST OF BIRDS OF THE WORLD, VOL. II—James Lee Peters—*Harvard Univ. Press,* xvii+401 p., $4. Ornithologists will welcome this second volume of what will undoubtedly be a work monumental in its scope and beyond estimation in its usefulness. The present volume includes birds from Megapodes to Auks.

Science News Letter, June 30, 1934

Medicine

RECENT ADVANCES IN VACCINE AND SERUM THERAPY—Alexander Fleming and G. F. Petrie—*Blakiston's,* 463 p., $4. This latest of the recent advances series will prove a valuable handbook for physicians and other medical scientists but is too technical for the non-scientific reader.

Science News Letter, June 30, 1934

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